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# Description

# Push-on Connector Interface

## Background of Invention

[0001] 1. Field of the Invention

[0002] The invention relates to a push-on electrical connector interface. More particularly the invention relates to a push-on coaxial connector interface for use with both modified and standard connector interfaces adapted for interconnection via a threaded coupling nut.

[0003] 2. Description of Related Art

[0004] Electrical connectors used in RF applications have become standardized to allow interoperability of equipment from different manufacturers. Examples of standard connector types include: SMA, Type N, BNC and Type F (CATV) connectors. Male Type F connectors include a threaded collar which mates to threads on the female interface to retain the interconnection. Alternatively, Male Type F connectors are available with spring fingers which form an interference fit when pushed over the threaded portion of a fe-

male Type F receptacle. Type F connectors using spring fingers are of suspect reliability because the retention of the connector relies upon the interference fit between the spring fingers and the female receptacle, the form of the interference fit having been adapted in a compromise between ease of insertion and retention. The high frequency electrical characteristics of the interconnection formed with the outer conductor may be less than satisfactory because of the absence of an electrical connection at areas between each of the spring fingers.

[0005] BNC connectors include radially projecting pins on the female portion which mate with slots in a spring biased male portion outer collar when the connectors are inserted together and the outer collar rotated, allowing a quick interconnection without use of tools. However, the comparatively complex BNC connector is significantly more expensive to manufacture than Type F. Both BNC and Type F connectors are typically used in low signal level and or inexpensive consumer applications.

[0006] Standardized connectors for higher power levels, such as SMA and Type N, use a threaded outer collar in the male portion which mates with threads formed in the outer diameter of the female portion.

[0007] The threaded outer collar requires multiple turns to fully seat the interconnection, consuming time and forcing the user to use both hands and or a wrench. Where connections are frequently changed, such as at a patch panel or with testing equipment, screwing and unscrewing the threaded outer collar becomes a burden.

[0008] Competition within the electrical connector industry has focused attention upon ease of use, electrical interconnection characteristics and connector reliability. Factors of commercial success also include reduction of manufacturing, materials and installation costs.

[0009] Therefore, it is an object of the invention to provide a connector interface that overcomes deficiencies in such prior art.

## Brief Description of Drawings

[0010] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with a general description of the invention given above, and the detailed description of the embodiments given below, serve to explain the principles of the invention.

[0011] Figure 1 is an external side view of a first embodiment of the invention, prior to interconnection.

[0012] Figure 2 is a cross sectional view of Figure 1, along line A-A, prior to interconnection.

[0013] Figure 3 is a close up view of area C from Figure 2.

[0014] Figure 4 is an external side view of a first embodiment of the invention, interconnected

[0015] Figure 5 is a cross sectional view of Figure 1, along line A-A, interconnected.

[0016] Figure 6 is a close up view of area C from Figure 5.

[0017] Figure 7 is front view of a canted coil spring.

[0018] Figure 8 is a side view of the canted coil spring of figure 7.

[0019] Figure 9 is an external side view of a second embodiment of the invention.

[0020] Figure 10 is an external side view of the second embodiment of the invention, with a spring clip attached.

## DETAILED DESCRIPTION

[0021] The invention is described with respect to figures 1-10 in a standard SMA female connector configuration. One skilled in the art will appreciate that the invention is similarly applicable to Type N connectors and or other standard or proprietary connector configurations having an end bore which allows an outer diameter surface of the

female portion to be contacted also upon an inner diameter surface.

[0022] As shown in figures 1-5, a standard SMA female connector body 1, shown here adapted for panel face mounting, has threads 3 on an outer diameter surface. Normally, the threads 3 are engaged by a rotatable outer threaded collar of an SMA male connector body. A male connector body 5, according to a first exemplary embodiment of the invention, contacts the threads 3 with a plurality of spring finger(s) 7 spaced around a front end of the male connector body 5.

[0023] The spring finger(s) 7 are adapted to form an interference fit over and against the threads 3 when the male connector body 5 is inserted along a longitudinal axis, demonstrated by section line A-A of figure 1, of the female connector body 1. A leading edge of each spring finger 7 may be formed with an angled face 9 to guide the initial centering of the male connector body 5 upon the female connector body 1, prior to push-on interconnection. The plurality of spring finger(s) 7 each co-operate together to create a secure mechanical and electrical interconnection between the female connector body 1 and the male connector body 5. To provide for spring fingers with an ac-

ceptable spring characteristic, strength and resilience, the male connector body may be formed from a metal alloy such as phosphor-bronze.

[0024] A sleeve 11 may be dimensioned for press-fitting into a bore of the male connector body 5, to seat against a shoulder 13 (figure 2). A front end portion of the sleeve 11 is dimensioned to fit within an inside diameter of a bore 16 formed in a leading edge of the female connector body 1. The leading edge 15 of the sleeve 11 is the surface which the female connector body 1 bottoms against when the male connector body 5 is fully pushed against the female connector body 1.

[0025] As shown in figure 3, a first groove 17 formed in an outer diameter of the front end portion of the sleeve 11 is adapted to seat a first spring 19 (figures 5 and 6). The first spring 19 is dimensioned to be compressed between the inside diameter surface of the leading edge of the female connector body 1 and the sleeve 11, creating an additional mechanical and electrical interconnection between the female connector body 1 and the male connector body 5. The first spring 19 may be, for example, a canted coil spring as show, for example, in Figures 7 and 8 or other form of spring formed from a conductive material, such as

a plurality of spring fingers projecting from a ring.

[0026] An insulator 21 positions an inner conductor contact 23 coaxially within the sleeve 11. The inner conductor contact 23 is adapted to interact with the standard inner conductor interface of the female conductor body 1, omitted here for clarity. Further, a cable end of the male connector body 5 has a coaxial cable attachment area 25 adapted to receive and secure the inner and outer conductors of a coaxial cable into mechanical and electrical interconnection with the inner conductor contact 23 and the male connector body 5, respectively. Specific adaptations for interfacing with the coaxial cable outer and inner conductors via, for example conductive adhesive, soldering, crimping and or mechanical compression, depend upon the type of coaxial cable interfaced with and whether a factory or field and permanent or removable interconnection is desired. These various means are well known to one skilled in the art and therefore are not disclosed with further detail herein.

[0027] In use, a male connector body 5, already attached to a coaxial cable, is centered upon an existing standard female connector body 1 and pushed into place. As the male connector body 5 is pushed upon the female con-

nector body 1 the plurality of spring finger(s) 7 are spread over the threads 3 creating a secure contact around the outer diameter surface of the female connector body between the spring finger(s) 7 and the threads 3. As the male connector body 5 continues along the female connector body 1, the leading edge 15 of the sleeve 11 is inserted within the inside diameter of the bore 16. The first spring 19 carried in first groove 17 is deformed between the first groove 17 and the inside diameter surface of the female connector body 1, creating a second secure contact between the female connector body 1 and the male connector body 5.

[0028] In a second exemplary embodiment, as shown in figures 9 and 10, a second groove 27 may be added to an outer surface of the spring finger(s) 7 as a seating surface for a second spring 29. The second spring 29 further biasing the spring finger(s) 7 into contact with the threads 3. The second spring 29 may also be a canted coil spring, as shown in figures 7 and 8. Alternatively, the second spring 29 may be replaced with an inward biased spring clip (figure 10) or a wire tie that may be attached after the male connector body 5 is seated upon the female connector body 1, thereby securing the interconnection against

separation.

[0029] If a third groove 31 is formed in the inside diameter surface of the female connector body 1, configured to align with the first groove 17 when the male connector body 5 is fully seated upon the female connector body 1, a detent function which operates by retaining the first spring 19 is created. The detent function creating a "click"feedback to the user that the interconnection has been made. When the third groove 31 is added to a standardized connector design, the resulting connector is operable with either the standardized threaded connectors or with the push-on connector and "click"interconnection feedback according to the invention.

[0030] The invention provides a simplified and cost effective connector interface for use with existing standard threaded connectors. The invention allows a user to quickly connect and disconnect interconnections without time consuming threading and or additional tools. Further, the invention provides multiple bias points and connection surfaces which create a secure mechanical and electrical interconnection. Additional electrical shielding is also provided by the first spring 19, further isolating the interconnection from high frequency signal leakage and or

interference.

Table of Parts

| | |
|---|---|
| 1 | female connector body |
| 2 | threads |
| 5 | male connector body |
| 7 | spring finger(s) |
| 9 | angled face |
| 11 | sleeve |
| 13 | shoulder |
| 15 | leading edge |
| 16 | bore |
| 17 | first groove |
| 19 | first spring |
| 21 | insulator |
| 23 | inner conductor contact |
| 25 | coaxial cable attachment area |
| 27 | second groove |
| 29 | second spring |
| 31 | third groove |

[0031] Where in the foregoing description reference has been made to ratios, integers or components having known equivalents then such equivalents are herein incorporated as if individually set forth.

[0032] While the present invention has been illustrated by the description of the embodiments thereof, and while the embodiments have been described in considerable detail, it is not the intention of the applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative apparatus, methods, and illustrative examples shown and described. Accordingly, departures may be made from such details without departure from the spirit or scope of applicant's general inventive concept. Further, it is to be appreciated that improvements and/or modifications may be made thereto without departing from the scope or spirit of the present invention as defined by the following claims.